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Device for Continuously Producing Drip Irrigation Tubes

The present invention relates to a device for continuously producing drip irrigation tubes comprising an extruding device for producing a tube body, a calibrating device, and a cooling device for the tube body, a feed apparatus for feeding dosing elements into the tube body along a guideway and means for
5 connecting the dosing elements to the inner walling of the tube body, comprising a pressing element which is formed by the end region of the guideway and protrudes into the extruded tube body, and a pressing member that is able to be pressed against the tube body from the exterior in the region
10 of the pressing element, the calibrating device being formed by a tubular body the feed region of which narrows to the desired diameter of the tube body, and the longitudinally elongated body area of which protrudes into the cooling device.

With known devices of this kind drip irrigation tubes are produced
15 with which a direct irrigation of plants is achievable. Installed in this tube in the region of each plant are dosing elements through which the water is let out dropwise via a bore. Through this direct dropwise irrigation of the individual plants a large amount of water is not wasted unnecessarily, as usually happens with irrigation systems by means of which the water is distributed over a large
20 area through spraying installations. With drip irrigation an extremely economical system is applied; the water can be used very sparingly.

Shown in EP-A-0 970 602 is a device for manufacturing drip irrigation tubes of this kind. Here a tube body is created by means of an extruding device, which body passes through a calibrating and cooling device.
25 Inserted successively into the tube body are dosing elements which are continuously pushed forward. As soon as the foremost dosing element comes into contact with the extruded tube walling, it is pulled along, and is connected to the tube body by means of a pressing body installed in the tube body and a pressing belt acting outside on the tube walling. The outlet aperture for the
30 water is then made in the tube walling in a known way.

With this known device, the pressing of the dosing elements on the inner walling of the tube body and the connection of the dosing element to the tube body behind the calibrating device takes place inside the cooling installation. Owing to the relatively long route inside the cooling installation, this means that the tube body has cooled off by a considerable amount by the time it reaches the pressing and connecting point. In order to be able nevertheless to achieve a good connection of the dosing elements to the inner walling of the tube body, the dosing elements are led through a heating device during insertion and are heated to a particular temperature. A heating device of this kind is costly however and involved. Moreover no tube with a wall thickness of under 0.2 mm can be produced with the above-described device since the welding of the dosing element to the tube does not take place in a sure way.

The object of the present invention thus consists in creating a device for manufacture of drip irrigation tubes in which the heating device for heating the dosing elements to be fed can be eliminated, and with which an optimal connection between the dosing elements and the inner walling of the tube body can nevertheless be achieved.

This object is achieved according to the invention in that the longitudinally elongated body area of the tubular body of the calibrating device is provided with a recess into which the pressing member protrudes so that the pressing and joining process of the dosing elements with respect to the inner walling of the tube body ensues inside the calibrating device.

With this configuration the extruded tube body is prevented from cooling down too much during the advance to the place where the pressing and connecting process takes place with respect to the dosing elements, so that the heating device for heating the dosing elements can be eliminated.

An advantageous embodiment of the invention consists in the recess in the longitudinally elongated body area of the tubular body having the shape of a slot extending from the end of the longitudinally elongated body area, protruding into the cooling device, to the walling closing off the cooling device,

through which the longitudinally elongated body area is led into the cooling device. A simple construction is thereby achieved.

The pressing member is advantageously designed as pressing roller. It is thereby ensured that the pressing pressure for connecting the dosing
5 elements to the inner walling of the tube body is constant over the entire length of the dosing element, so that it is optimal, and excluded is the risk of affecting the labyrinth passage, for instance through too great pressing in particular regions.

Through the possibility of being able to adjust the pressing pressure
10 of the pressing roller on the tube body, this pressure can be adapted to the nature of the tube and of the dosing element.

A further advantageous embodiment of the invention consists in the pressing roller having an indentation corresponding to the outer contour of the tube body in the region of the calibrating device. Thereby achieved is a uniform
15 pressure of the pressing roller over the entire width of the dosing element; the connection becomes optimal.

A further advantageous embodiment of the invention consists in a marking structure, running over the entire circumference, being provided at least at the bottom of the indentation of the pressing roller, which marking
20 structure is transferable to the surface of the tube body in the area of the dosing element. This marking of the surface of the tube body makes it possible for the position of the dosing element in the tube body to be precisely determinable from outside, so that the bore for the outlet can be made at the correct place, regardless of the spacing apart of the dosing elements from one
25 another.

A further advantageous embodiment of the invention consists in the feed apparatus including a separating device, in which the next of the continuously fed dosing elements is able to be captured in each case, ejected in a way guided onto the guideway, and inserted into the tube body by means
30 of an airstream along the guideway.

Drip irrigation tubes can thereby be produced whose dosing elements have a selectable spacing apart from one another. This is particularly advantageous, for instance, for the irrigation of trees or bushes in that the respective drip irrigation tube has a plurality of dosing elements with outlets, having a relatively small spacing apart from one another, in the vicinity of the roots of these plants. Between the plants however these drip irrigation tubes have no outlets over a larger distance, whereby this interim region is not irrigated as well.

Advantageously the separating unit is composed of two drivable rollers, disposed opposite one another, in each case one dosing element of the continuously fed dosing elements being able to be captured by the two rollers, brought into a waiting position, and ejected therefrom onto the guideway. In this way the dosing elements can be optimally installed with the desired spacing in the tube body.

Installed in the guideway is a sensor, with which the reaching of the waiting position of the respective dosing element can be detected, whereby a failure-free production process is ensured.

The airstream is producible with air jets which are formed by supply lines that come out into the guideway, the supply lines being disposed such that the airstream coming out hits the dosing element, to be advanced, at an angle of about 25°. Thus very fast and simple transport of the dosing elements is achieved; precision is ensured.

An embodiment of the present invention will be described more closely in the following, by way of example, with reference to the enclosed drawing.

Shown are:

Figure 1, a schematic sectional drawing of the device according to the invention in the region of the separating device, of the extrusion device, of the calibrating device and of the cooling device;

Claims

1. Device for continuous manufacture of drip irrigation tubes, comprising an extruding device (1) for producing a tube body (2), a calibrating device (3), and a cooling device (19) for the tube body (2), a feed apparatus (5) for feeding dosing elements (6) into the tube body (2) along a guideway (4), and means for connecting the dosing elements (6) to the inner walling of the tube body (2), comprising a pressing element (17) which is formed by the end area of the guideway (4) and which protrudes into the extruded tube body (2), and a pressing member (18) which is able to be pressed against the tube body (2) from the exterior in the region of the pressing element (17), the calibrating device (3) being formed by a tubular body (22) whose feed region (23) narrows to the desired diameter of the tube body (2) and whose longitudinally elongated body area (24) protrudes into the cooling device (19), characterized in that the longitudinally elongated body area (24) of the tubular body (22) of the calibrating device (19) <sic. (3)> is provided with a recess (27) into which the pressing member (18) protrudes so that the pressing and connecting process of the dosing elements (9) with respect to the inner walling of the tube body (22) ensues inside the calibrating device (3).

2. Device according to claim 1, characterized in that the recess (27) in the longitudinally elongated body area (24) of the tubular body (22) has the form of a slot which extends from the end (29) of the longitudinally elongated body area (24), protruding into the cooling device (19), to the walling (26) closing off the cooling device (19), through which the longitudinally elongated body area (24) is led into the cooling device (19).

3. Device according to claim 1 or 2, characterized in that the pressing member is a pressing roller (18), and in that the pressing pressure of the pressing roller (18) against the tube body (2) is adjustable.

4. Device according to claim 3, characterized in that the pressing roller (18) has an indentation (20), which corresponds to the outer contour of the tube body (2) in the region of the calibrating device (3).

5 5. Device according to claim 4, characterized in that at least at the bottom of the indentation (20) of the pressing roller (18) a marking structure (21) is applied running over the entire circumference, which marking structure is transferable to the surface of the tube body (2) in the region of the respective dosing element (6).

10 6. Device according to one of the claims 1 to 5, characterized in that the feed apparatus (4, 5) comprises a separating device (7), into which the next of the continuously fed dosing elements (6) is able to be captured in each case, ejected in a way guided onto the guideway (4), and inserted into the tube body (2) by means of an airstream along the guideway (4).

15 7. Device according to claim 6, characterized in that the separating device (7) is made up of two drivable rollers (8, 9), disposed opposite one another, and in that in each case one dosing element (6') of the continuously fed dosing elements (6) is able to be captured by the two rollers (8, 9), brought into a waiting position, and ejected therefrom onto the guideway (4).

8. Device according to claim 7, characterized in that installed in the guideway (4) is a sensor (13), with which the reaching of the waiting position of the respective dosing element (6') is detectable.

20 9. Device according to one of the claims 6 to 8, characterized in that the airstream is producible with air jets (14), which are formed by supply lines (15) that come out into the guideway (4), and in that the supply lines (15) are disposed such that the airstream coming out in each case hits the dosing element (6), to be advanced, at an angle of about 25°.

Abstract

A device for continuous manufacture of drip irrigation tubes comprises an extruding device (1) for producing a tube body (2), a calibrating device (3), and a cooling device (19) for the tube body (6) <sic. (2)>. In addition, 5 a feed apparatus (5) for feeding dosing elements (6) into the tube body (2) and means for joining these dosing elements (6) to the inner walling of the tube body (2) are provided, comprising a pressing element (17) which is formed by the end area of the guideway (4) and which protrudes into the extruded tube body (2), and a pressing member (18) which is able to be pressed against the 10 tube body (2) from the exterior in the region of pressing element (17), the calibrating device (3) being formed by a tubular body (22) whose feed region (23) narrows to the desired diameter of the tube body (2) and whose longitudinally elongated body area (24) protrudes into the cooling device (19). The longitudinally elongated body area (24) of the tubular body (22) of the 15 calibrating device (3) is provided with a recess (27) into which the pressing member (18) protrudes so that the pressing and joining process of the dosing elements (9) with respect to the inner wall of the tube body (22) ensues inside the calibrating device (3). Thus the tube body (2) does not cool too much before the joining process, and the connection to the dosing elements (9) becomes 20 optimal, without these dosing elements having to be preheated.

(Figure 1)